

II. Rejection of Claims 1 to 4 Under 35 U.S.C. § 103(a)

Claims 1 to 4 were rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,529,315 ("Borrino et al.") in view of U.S. Patent No. 6,528,168 ("Matsumoto et al."). Applicant respectfully submits that claims 1 to 4 are allowable for the following reasons.

Claim 1 relates to a rotating mechanical seal. Claim 1 recites that the mechanical seal includes a sliding ring (5) and a non-rotating backing ring (4). Claim 1 further recites that the sliding ring is attached to a shaft (1) by an O-ring (6) and rotates with the shaft (1). Claim 1 further recites that the non-rotating backing ring (4) is attached by way of an O-ring (3) to a housing (2) of a compressor so as to be gas-tight. Claim 1 further recites that the sliding ring (5) and backing ring (4) are pressed one against the other by way of a spring (8) to form a seal and slide one upon the other. Claim 1 further recites that one of the rings (4, 5) is made of a carbon and silicon carbide composite material and the other of a silicon carbide material.

The Office Action alleges that Borrino et al. disclose a mechanical seal comprising a sliding ring 100 attached to a shaft, for rotation by an O-ring 158, and a non-rotating backing ring 110 attached to a housing 128 by an O-ring 124. The Office Action further alleges that a spring 146 presses the rings together to form a seal. The Office Action further alleges that Borrino et al. disclose that the sliding ring is made from carbon and the backing ring 110 is made of silicon carbide. The Office Action admits that Borrino et al. does not disclose that one of the rings is made from a carbon/silicone carbide composite material. The Office Action alleges, however, that Matsumoto et al. teach a carbon/silicone carbide composite material that is used for sliding members. The Office Action thus concludes that it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the carbon ring 100 of Borrino by forming C/SiC composite material as allegedly taught by Matsumoto et al. to provide excellent self-lubricating and wear resistance.

Firstly, Applicant respectfully submits that the Office Action's reading of Borrino et al. is overly broad. As indicated above, the Office Action alleges that the sliding ring is made from carbon and refers to col. 10, lines 20 to 21, for support. However, this reference states that the sliding ring is made from carbon graphite not carbon, as the Office Action alleges.

Second, Applicant submits that the purported disclosure of a mechanical seal having rings made from carbon graphite and silicon carbide and the purported disclosure of

the use of a carbon/silicon carbide composite material for sliding members does not render obvious the use of a mechanical seal having one ring made from carbon together and a second ring made from a silicon carbide composite material, as recited in claim 1. Nowhere do Matsumoto et al. disclose, or even suggest, the desirability of using the specific **combination** of a first silicon carbide ring and a second ring made from a silicon carbide composite material, as recited in claim 1. Matsumoto et al. may state that carbon/silicon carbide composite material maybe used for seals in general but nowhere do Matsumoto et al. disclose, or even suggest, what type of material this composite material **would be sealing against**. In rotating mechanical seals, the carbon slip-promoting material, which exhibits a lower modulus of elasticity, is deformed under pressure when it is subjected to high pressure due to the carbon dioxide pressure whereby damage to the sealing surfaces will occur. As stated on page 2 of the Specification, to avoid this problem, it is conceivable to use a combination of a hard material with a high modulus of elasticity such as silicon carbide or tungsten carbide for both parts in order to avoid deformation and damage to the sealing surfaces. However, the sliding properties between a combination of these hard materials is disadvantageous to the extent that under poor lubricating conditions, erosion or roughening of the surface or similar effects occur wherein the sealing performance is reduced. The inventors of the present invention have discovered that the combination a first silicon carbide ring and a second ring made from a silicon carbide composite material, as recited in claim 1, mitigates this erosion problem. Accordingly, Applicant respectfully submits that neither Borrino et al. or Matsumoto et al. disclose all of the limitations of claim 1. (2)

In rejecting a claim under 35 U.S.C. § 103(a), the Examiner bears the initial burden of presenting a prima facie case of obviousness. *In re Rijckaert*, 9 F.3d 1531, 1532, 28 U.S.P.Q.2d 1955, 1956 (Fed. Cir. 1993). To establish prima facie obviousness, three criteria must be satisfied. First, there must be some suggestion or motivation to modify or combine reference teachings. *In re Fine*, 837 F.2d 1071, 5 U.S.P.Q.2d 1596 (Fed. Cir. 1988). This teaching or suggestion to make the claimed combination must be found in the prior art and not based on the application disclosure. *In re Vaeck*, 947 F.2d 488, 20 U.S.P.Q.2d 1438 (Fed. Cir. 1991). Second, there must be a reasonable expectation of success. *In re Merck & Co., Inc.*, 800 F.2d 1091, 231 U.S.P.Q. 375 (Fed. Cir. 1986). Third, the prior art reference(s) must teach or suggest all of the claim limitations. *In re Royka*, 490 F.2d 981, 180 U.S.P.Q. 580 (C.C.P.A. 1974). As stated above, Borrino et al. fail to disclose, or even suggest, each and every feature of claim 1. Specifically, Borrino et al. do not disclose, or even suggest, one of the rings (4, 5) made of a carbon and silicon carbide composite material and the other of a

silicon carbide material, as recited in claim 1. Nor does the alleged general disclosure of Matsumoto et al., of the use of a carbon/silicone carbide composite material for sliding members, cure the deficiencies of Borrino et al. It is therefore respectfully submitted that the combination of Borrino et al. and Matsumoto et al. does not render obvious claim 1.

Moreover, it is respectfully submitted that the cases of *In re Fine*, *supra*, and *In re Jones*, 21 U.S.P.Q.2d 1941 (Fed. Cir. 1992), make plain that the Office Action's generalized assertions that it would have been obvious to modify or combine the reference do not properly support a § 103 rejection. It is respectfully submitted that those cases make plain that the Office Action reflects a subjective "obvious to try" standard, and therefore does not reflect the proper evidence to support an obviousness rejection based on the reference relied upon. In particular, the Court in the case of *In re Fine* stated that:

The PTO has the burden under section 103 to establish a *prima facie* case of obviousness. It can satisfy this burden only by showing some objective teaching in the prior art or that knowledge generally available to one of ordinary skill in the art would lead that individual to combine the relevant teachings of the references. This it has not done. . . .

Instead, the Examiner relies on hindsight in reaching his obviousness determination. . . . One cannot use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention.

In re Fine, 5 U.S.P.Q.2d at 1598 to 1600 (citations omitted; italics in original; emphasis added). Likewise, the Court in the case of *In re Jones* stated that:

Before the PTO may combine the disclosures of two or more prior art references in order to establish *prima facie* obviousness, there must be some suggestion for doing so, found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. . . .

Conspicuously missing from this record is any evidence, other than the PTO's speculation (if it be called evidence) that one of ordinary skill . . . would have been motivated to make the modifications . . . necessary to arrive at the claimed [invention].

In re Jones, 21 U.S.P.Q.2d at 1943, 1944 (citations omitted; italics in original).

That is exactly the case here since it is believed and respectfully submitted that the present Office Action offers no evidence whatsoever, but only conclusory hindsight, reconstruction and speculation, which these cases have indicated does not constitute evidence that will support a proper obviousness finding. Unsupported assertions are not evidence as to why a person having ordinary skill in the art would be motivated to modify or combine

references to provide the claimed subject matter of the claims to address the problems met thereby. Accordingly, the Office must provide proper evidence of a motivation for modifying or combining the reference to provide the claimed subject matter.

More recently, the Federal Circuit in the case of *In re Kotzab* has made plain that even if a claim concerns a "technologically simple concept" -- which is not the case here -- there still must be some finding as to the "specific understanding or principle within the knowledge of a skilled artisan" that would motivate a person having no knowledge of the claimed subject matter to "make the combination in the manner claimed," stating that:

In this case, the Examiner and the Board fell into the hindsight trap. The idea of a single sensor controlling multiple valves, as opposed to multiple sensors controlling multiple valves, is a technologically simple concept. With this simple concept in mind, the Patent and Trademark Office found prior art statements that in the abstract appeared to suggest the claimed limitation. But, there was no finding as to the specific understanding or principle within the knowledge of a skilled artisan that would have motivated one with no knowledge of Kotzab's invention to make the combination in the manner claimed. In light of our holding of the absence of a motivation to combine the teachings in Evans, we conclude that the Board did not make out a proper prima facie case of obviousness in rejecting [the] claims . . . under 35 U.S.C. Section 103(a) over Evans.

In re Kotzab, 55 U.S.P.Q.2d 1313, 1318 (Fed. Cir. 2000) (emphasis added). Again, it is believed that there have been no such findings.

Accordingly, there is no evidence that the reference relied upon, whether taken alone, combined or modified, would provide the features and benefits of claim 1 herein. It is therefore respectfully submitted that claim 1 is allowable for these reasons. Therefore, withdrawal of the 35 U.S.C. § 103(a) rejection and allowance of claim 1 is respectfully requested.

As for claims 2 to 4, which depend on claim 1 and therefore include all of the limitations of claim 1, Applicant respectfully submits that these claims are allowable for at least the same reasons provided above in support of the patentability of claim 1. Therefore, withdrawal of the 35 U.S.C. § 103(a) rejection and allowance of claims 2 to 4 is respectfully requested.

III. Rejection of Claims 5 to 16 Under 35 U.S.C. § 103(a)

Claims 5 to 16 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Borrino et al. in view of Matsumoto et al. in further view of U.S. Patent No. 5,834,387

("Divakar et al."). Applicant respectfully submits that claims 5 to 16 are allowable for the following reasons.

The Office Action admits that neither Borrino et al. or Matsumoto et al. disclose silicone carbide with a pore size not greater than $60\mu\text{m}$ at a porosity of 2% to 15%. The Office Action alleges, however, that Divakar et al. teach forming a silicon carbide ring with a mean pore size of not greater than $60\mu\text{m}$ at a porosity of 2% to 12%. The Office Action further alleges that Divakar et al. teach that this pore size and porosity improves the rings ability to retain a hydrodynamic film and thus ensures a better seal. The Office Action thus concludes that it would have been obvious for one of ordinary skill in the art at the time the invention was made to modify the mechanical seal of Borrino et al. in view of Matsumoto et al. with the porosity, pore size and surface roughness allegedly taught by Divakar et al. to ensure a better seal.

Claims 5 to 16 ultimately depend on claim 1 and therefore include all of the limitations of claim 1. Therefore, Applicant submits that these claims are patentable for at least the same reasons provided above in support of the patentability of claim 1. Specifically, Borrino et al. do not disclose, or even suggest, the **combination** of one of the rings (4, 5) made of a carbon and silicon carbide composite material and the other of a silicon carbide material, as recited in claim 1. Nor does the alleged general disclosure of Matsumoto et al., of the use of a carbon/silicone carbide composite material for sliding members, or the alleged specific disclosure of Divakar et al., of a specific silicon carbide material, cure the deficiencies of Borrino et al. Therefore, withdrawal of the 35 U.S.C. § 103(a) rejection and allowance of claims 5 to 16 is respectfully requested.

As for claims 9 to 16, Applicant submits the following additional reasons in support of patentability. Claims 9 to 16 all recite that the carbon and silicon carbide composite material exhibits sealing surface properties with a roughness value of from $0.005\mu\text{m}$ to $0.07\mu\text{m}$. The Office Action alleges that Divakar et al. teach forming a silicon carbide ring with a mean pore size of not greater than $60\mu\text{m}$ at porosity of 2% to 12%. However, the Office Action does not allege, nor do any of the cited references disclose, or even suggest, that the carbon and silicon carbide composite material exhibits sealing surface properties with a roughness value of from $0.005\mu\text{m}$ to $0.07\mu\text{m}$, as recited in claims 9 to 16. Therefore, neither Borrino et al., Matsumoto et al. or Divakar et al. recite all of the limitations of claims 9 to 16. Accordingly, the combination of Borrino et al., Matsumoto et al. and Divakar et al. does not render obvious claims 9 to 16.

In summary, there is no evidence that the reference relied upon, whether taken alone, combined or modified, would provide the features and benefits of claims 5 to 16 herein. It is therefore respectfully submitted that claims 5 to 16 are allowable for these reasons. Therefore, withdrawal of the 35 U.S.C. § 103(a) rejection and allowance of claims 5 to 16 is respectfully requested.

IV. Conclusion

It is therefore respectfully submitted that all of the presently pending claims are allowable. All issues raised by the Examiner having been addressed, an early and favorable action on the merits is earnestly solicited.

Respectfully submitted,

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